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Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

In the Matter of:	)	
	)	
Petition of the Intelligent Transportation Society of America for Amendment of the Commission's Rules to Add Intelligent Transportation Services (ITS) as a New Mobile Service With Co-Primary Status in the 5.850 to 5.925 GHz Band	)	RM-9096

To: The Commission

REPLY COMMENTS OF MINNESOTA MINING AND MANUFACTURING COMPANY

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SUMMARY

Minnesota Mining and Manufacturing Company (3M) is submitting its reply comments relating to the proposal of the Intelligent Transportation Society of America (ITS America) for an allocation of frequencies in the 5.850-5.925 GHz band for intelligent transportation systems. The record reflects strong support for the ITS America proposal, and the Commission should proceed at once to commence a rule making in this matter.

Mark IV Industries, Ltd. expresses concern that the 5.8 GHz band may not be entirely suitable for the proposed operations. However, 3M is providing an analysis showing that Mark IV's concerns are misplaced. 3M provides a more realistic analysis of the feasibility of the 5.8 GHz band.

3M also believes that incumbent users such as Resound Corporation and amateur radio licensees should be relocated from the 5.8 GHz band, to ensure that intelligent transportation systems can operate in an interference free environment, given the important safety functions these systems will serve. Further, 3M does not believe that a Commercial Mobile Radio Service allocation is appropriate for intelligent transportation operations. Finally, the RF radiation concerns of the Cellular Phone Taskforce have been addressed by the Commission in ET Docket No. 93-62, and do not justify restrictions on the proposed systems.

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Petition of the Intelligent	)	
Transportation Society of America	)	
for Amendment of the Commission's	)	RM-9096
Rules to Add Intelligent Transportation	)	
Services (ITS) as a New Mobile Service	)	
With Co-Primary Status in the 5.850 to	)	
5.925 GHz Band	)	

To: The Commission

REPLY COMMENTS OF MINNESOTA MINING AND MANUFACTURING COMPANY

Minnesota Mining and Manufacturing Company ("3M"), by its attorney, hereby submits the following reply comments in response to comments filed on the Petition for Rule Making filed by the Intelligent Transportation Society of America ("ITS America"), requesting the Commission to allocate frequencies in the band 5.850-5.925 GHz for use by Intelligent Transportation Systems ("ITS"), and specifically to provide for the use of Dedicated Short Range Communication ("DSRC") based systems. The record shows that 3M and the vast majority of commenters support the proposed allocation, since highway efficiency and public safety will be enhanced.[1] 3M addresses various comments filed by other parties below:

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[1] As discussed in its initial comments, 3M produces antennas for ITS operations, and is developing the Electronic License Plate (ELP) discussed in the ITS America Petition (pp. 15-16). Moreover, 3M is currently advancing its plans to enter the ITS DSRC market. 3M also plans to develop a system for the narrow band ITS market.

I. Reply to Mark IV Industries Comments

Mark IV Industries, Ltd. ("Mark IV") urges the Commission to ensure the continued availability of the 902 - 928 MHz band for Location and Monitoring Service ("LMS") uses, and to ensure that LMS users have a choice of frequency bands and technologies in the future. 3M agrees that the continued availability of the 902 - 928 MHz band for current users is important, but future ITS concerns will be more efficiently orchestrated by utilization of a common frequency band at 5.8 GHz. Further, 3M must take issue with certain aspects of Mark IV's analysis of the usefulness of the 5.8 GHz band. In particular, Mark IV's "RISK ANALYSIS OF USING 5.8 GHZ BAND FOR VEHICLE-TO-ROADSIDE COMMUNICATIONS" contains a number of technical miscalculations and omissions in the four areas discussed; these four areas are listed below:

1. Path Loss
2. Multipath Effect
3. Noise Immunity
4. Size/Cost

1. Path Loss: While the 16 decibel ("dB") difference in path loss between 915 MHz and 5.8 GHz is correct, the noted methods of compensation for path loss omits one obvious advantage of 5.8 GHz operation, namely, the greatly reduced aperture size of 5.8 GHz

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Accordingly, 3M is vitally concerned that adequate spectrum be made available, and suitable rules and standards be adopted, for current and future ITS applications.

antennas. An array can be designed to compensate for the additional path loss at 5.8 GHz; and due to the small aperture size, this array would occupy the same volume as a single 915 MHz antenna.

2. Multipath Effect: The Figures 1, 2 and 3 in the Mark IV analysis appear to be incorrect. The simulated propagation losses show null depths of 12-33 dB for both 915 MHz and 5.8 GHz; this is only possible over a metallic surface where the reflection coefficient is -1. In reality, a roadway surface of concrete or asphalt has a dielectric constant of approximately 3, and therefore the propagation characteristics are completely different from what the Mark IV analysis portrays. Two simulations prepared by 3M are attached as Exhibit 1 for physical scenarios similar to the Mark IV analysis. Figure 1 shows the propagation characteristics of a horizontally polarized system. While the frequency of the nulls is similar, the depth of the nulls for both 5.8 GHz and 915 MHz are only 3-9 dB. Therefore, even though there are 5-6 more nulls at 5.8 GHz as compared to 915 MHz, the depth of the nulls are relatively minor and would not be a problem. Furthermore, since the roadway surface is not perfectly smooth, a scattering of the reflected wave will occur, reducing the reflected signal level and thereby making the amplitude of the nulls even smaller. Figure 2 shows a similar analysis for a vertically polarized system. From Figure 2 it can be seen that the amplitude of the nulls is significantly less than even the small nulls seen with horizontal polarization. 3M has

performed innumerable on-road tests to evaluate roadway propagation characteristics at 5.8 GHz.[2] 3M's experimental results confirm the theoretical simulations in Figures 1 and 2. It is respectfully submitted that 3M's approach represents a more realistic evaluation of the multipath effects.

3. Noise Immunity: As discussed in the first section, the path loss at 5.8 GHz is greater than at 915 MHz. Therefore, beyond the communication zone the signal strength decreases faster, thereby improving the noise immunity at 5.8 GHz as compared to 915 MHz. Also, if the antenna gain is increased (as discussed in section 1, above) there would not be a need for increased transmitter power or improved receiver sensitivity (thereby eliminating the potential deleterious consequences discussed by Mark IV).

4. Size/Cost: The cost of 5.8 GHz equipment will initially be greater than 915 MHz equipment, but this cost is only due to the cost of the RF (Radio Frequency) electronics. At one time in the not-so-distant past the cost of 800-900 MHz components was also quite high, but after the allocation of these frequencies for

---

[2] Vehicle-to-Roadside Communication Study, 4/9/96, (Experimental evaluation of roadside and vehicle antenna locations, signal polarization and traffic conditions on Direct Short Range Communication, prepared by 3M for ARINC and the Federal Highway Administration); Requirements for Direct Short Range Vehicle to Roadside Communications , February 1-8 1997, (1997 IEEE AEROSPACE CONFERENCE). Due to their volume, 3M has not attached these documents, but will provide them to the Commission and the parties to this proceeding upon request.

cellular, paging, Specialized Mobile Radio ("SMR") and Part 15 devices, competition and demand drove down the cost dramatically. The same result has been seen in the PCS/PCN band around 2 GHz, and will be seen at 5.8 GHz. The ultimate cost may be higher at 5.8 GHz, but only by a small percentage. This cost will be more than offset by the increased availability of spectrum and development of new technologies for intelligent transportation systems. The purpose of this rulemaking should be to explore these new possibilities, rather than focusing on competitive posturing.

II. Reply to Resound Corporation Comments

Resound Corporation is concerned about interference from DSRC operations to the hearing aids it manufactures. While Resound has coined the term "Quiet Band" for 5.8 GHz, this is at best a misnomer. The belief by Resound that "the Commission's rules provide special protection against harmful interference to devices operating within this frequency range" is incorrect. Under Part 15 there is only limited protection against interference, as set forth in Rule Section 15.5:

> **§15.5 General conditions of operation.**
>
> (a) Persons operating intentional or unintentional radiators shall not be deemed to have any vested or recognizable right to continued use of any given frequency by virtue of prior registration or certification of equipment, or, for power line carrier systems, on the basis of prior notification of use pursuant to §90.63(g) of this chapter.

(b) Operation of an intentional, unintentional, or incidental radiator is subject to the conditions that no harmful interference is caused and that interference must be accepted that may be caused by the operation of an authorized radio station, by another intentional or unintentional radiator, by industrial, scientific and medical (ISM) equipment, or by an incidental radiator.

(c) The operator of a radio frequency device shall be required to cease operating the device upon notification by a Commission representative that the device is causing harmful interference. Operation shall not resume until the condition causing the harmful interference has been corrected.

(d) Intentional radiators that produce Class B emissions (damped wave) are prohibited.

As reflected above, Part 15 devices are afforded no protection from devices operating under Part 90, Part 18 or other Parts. For example, Part 18 devices operating at 5.8 GHz +/- 75 MHz have no power or field strength limitations, as described in Sections 18.301 and 18.305 of the Commission's Rules, respectively. The only protection provided in Rule Section 15.249 is with respect to other devices operating under the same part.

III. Reply to the American Radio Relay League (ARRL) Comments

Amateur radio operation is potentially the greatest source of interference to future ITS operations in the 5.850-5.925 GHz band. Many of the applications that will be implemented in the ITS 5.850-5.925 GHz band deal with public safety-related communications; therefore it is imperative that only minimal interference be allowed. According to the rule governing Amateur operations in the

5.650-5.925 GHz band (Rule Section 97.313(b)) "[n]o station may transmit with a transmitter power exceeding 1.5 kW PEP." Since amateur radio stations consist of mobile and base units of indeterminable location, an amateur station could "swamp out" an entire area with the 1500 watt power levels allowed in Rule Section 97.313, rendering any communication links in that area unavailable for public safety applications.

As noted in the ARRL comments, only specific portions of the 5.650-5.925 GHz allocation are currently being utilized. Unused or under-utilized portions of the Amateur allocation include the 5.850-5.925 GHz band. Frequency spectrum allocations for "Hobby Radio" are outlined in Rule Section 97.301 and are summarized below:

ITU-Region 2 Amateur Radio Spectrum Allocations above 50 MHz:

Band Designation	Frequency Range	Spectrum Allocation
6 meters	50-54 MHz	4 MHz
2 meters	144-148 MHz	4 MHz
1.25 meters	219-220 MHz	2 MHz
	222-225 MHz	3 MHz
70 cm	420-450 MHz	30 MHz
33 cm	902-928 MHz	26 MHz
23 cm	1240-1300 MHz	60 MHz
13 cm	2300-2310 MHz	10 MHz
	2390-2450 MHz	60 MHz
9 cm	3.3-3.5 GHz	200 MHz
5 cm	5.650-5.925 GHz	275 MHz
3 cm	10.00-10.50 GHz	500 MHz
1.2 cm	24.00-24.25 GHz	250 MHz
6 mm	47.0-47.2 GHz	200 MHz
4 mm	75.5-81.0 GHz	4500 MHz
2.5 mm	119.98-120.02 GHz	40 MHz
2 mm	142-149 GHz	7000 MHz

1 mm	241-250 GHz	9000 MHz

From Rule Section 97.301 it can be seen that amateur radio has access to 1624 MHz of spectrum allocated between 50 MHz and 50 GHz, and an additional 20.54 GHz of spectrum allocated between 50 GHz and 300 GHz. Any displacement from unused or under-utilized portions of the 5 cm amateur allocation due to an ITS allocation of spectrum will not impair current or future amateur needs.

IV. Reply to the BellSouth Corporation Comments

The BellSouth Corporation ("BellSouth") suggestion that "a portion of the proposed ITS spectrum allocation should be set aside for commercial mobile radio service (CMRS)" is not in step with the philosophy of ITS. ITS is being developed to communicate roadway information between the roadside and the vehicle. Spectrum auctions envisioned by BellSouth can only be successful where private information is being communicated (e.g. cellular, PCS, etc.) for a fee. The information ITS systems will be broadcasting and receiving pertains to immediate roadway safety and efficiency concerns. Roadway government authorities (local and national) need to be the drivers of ITS application implementation and any remuneration can be handled on a case-by-case basis by the proper government authority. Further, if an auctioning of ITS spectrum would occur for "commercial" interests, there would need to be a nation-wide

auction with at least two (or more) entities receiving spectrum for competitive reasons. To avoid potential local interference, it would be necessary that each entity be assigned at least two channels. Obviously, this scenario would consume the majority of spectrum now being petitioned for by ITS.

V. RF Safety Concerns of the Cellular Phone Taskforce

On August 9, 1997 the Cellular Phone Taskforce ("Taskforce") submitted "Reply Comments" which raised, for the first time in the proceeding, concerns about the safety of allowing DSRC technology, based on claims that excessive exposure of humans to microwave radiation will have adverse health consequences.[3] This same contention was raised by the Taskforce, and others, in ET Docket No. 93-62, where the Commission established the guidelines for evaluating the environmental effects of radio frequency ("RF") radiation. Subsequent to the filing of the Taskforce reply comments in the above-captioned proceeding, the Commission has addressed the Taskforce concerns in the Second Memorandum Opinion and Order and Notice of Proposed Rulemaking in ET Docket 93-62, Mimeo No. FCC 97-303, rel. August 25, 1997. The Commission specifically rejected the arguments of the Taskforce that the

[3] Since the Taskforce did not raise these issues during the initial comment cycle, 3M presumes that the Commission will treat the Taskforce filing as an initial comment. To the extent deemed necessary, leave to respond to the Taskforce filing is requested, since the parties to this proceeding have not had any other opportunity to address the concerns raised therein.

Commission's RF exposure rules were inadequate. In so doing, the Commission made the following observation:

> "As for claims that our guidelines are not protective enough, we reiterate that these guidelines are based on recommendations of expert organizations and federal agencies with responsibilities for health and safety. It would be impracticable for us to independently evaluate the significance of studies purporting to show biological effects, determine if such effects constitute a safety hazard, and then adopt stricter standards tha[n] those advocated by federal health and safety agencies. This is especially true for such controversial issues as non-thermal effects and whether certain individuals might be "hypersensitive" or "electrosensitive."
>
> Id., at Para 31.

The Commission further noted that its guidelines were based on careful consideration of well over 150 sets of comments, and extensive consultations with all of the relevant health and safety agencies. Id. at Para. 34. The issue of "non-thermal" effects of RF was explicitly addressed in the most recent standard adopted by the American National Standards Institute / Institute of Electrical and Electronics Engineers, Inc. (ANSI / IEEE), which concluded that no reliable scientific data exist to indicate that such effects may be meaningfully related to human health. Id. at Para. 28. Since agencies with far more expertise on health matters than the FCC have not found a basis for the Taskforce claims, and since the Commission has set its RF exposure limits at a level ten times more restrictive than the scientifically established level of harmful RF effects, it is respectfully submitted that there is no basis to eliminate DSRC technology due to RF concerns. 3M stands ready to

ensure that any DSRC technology which it helps to develop will fully comply with all federal health and safety guidelines.

Conclusion

In light of the foregoing, 3M respectfully requests that the Commission proceed expeditiously to adopt the proposal of ITS America, with the modifications suggested in 3M's July 28, 1997 Comments.

Respectfully submitted,

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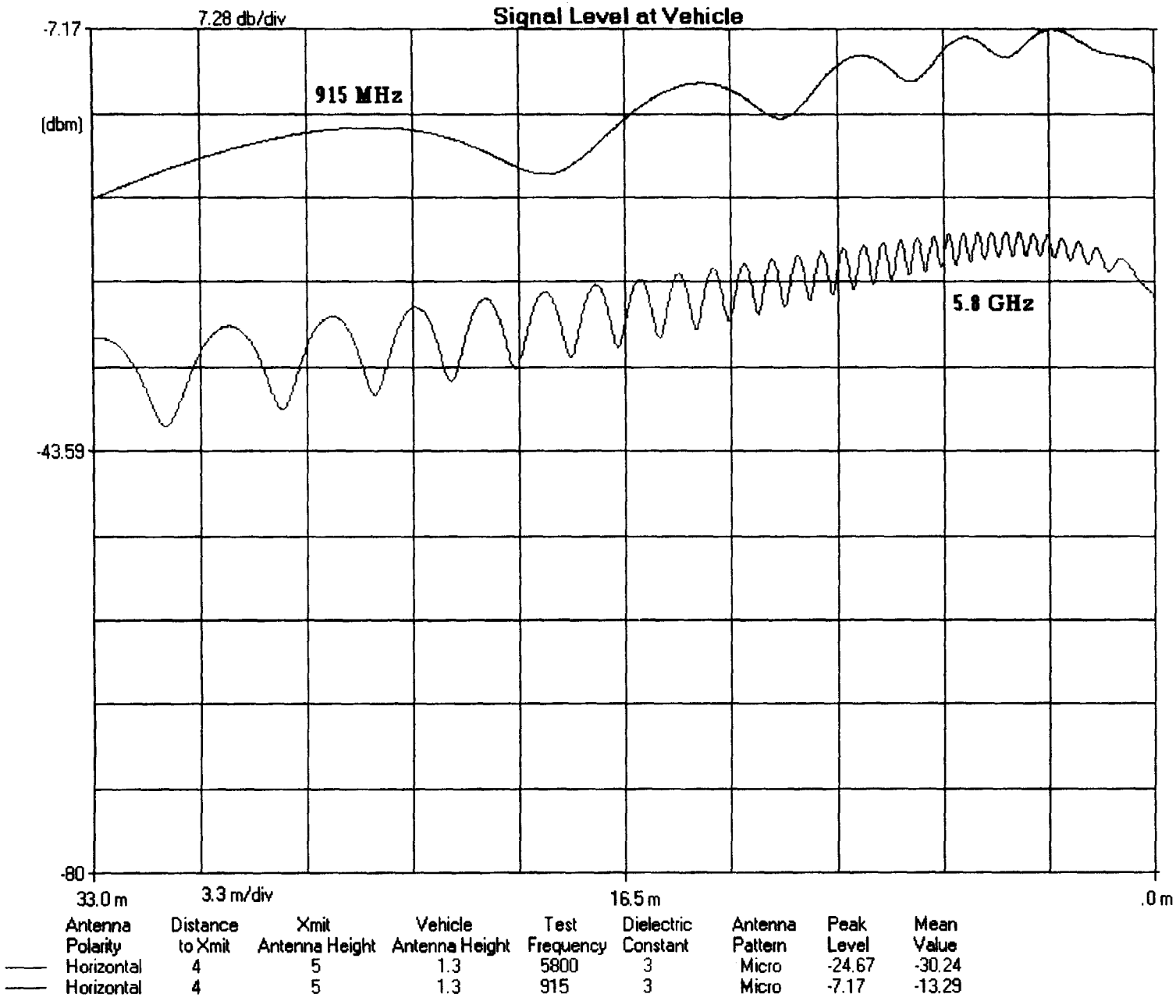
Dated: September 17, 1997

EXHIBIT 1



Antenna Polarity	Distance to Xmit	Xmit Antenna Height	Vehicle Antenna Height	Test Frequency	Dielectric Constant	Antenna Pattern	Peak Level	Mean Value
Horizontal	4	5	1.3	5800	3	Micro	-24.67	-30.24
Horizontal	4	5	1.3	915	3	Micro	-7.17	-13.29

Horizontal Polarity
Microstrip
Multiple Plot
dbm Scale

Start Distance
33 m

End Distance
0 m

Steps
1000

Y Distance
4 m

Antenna Height Roadside
5 m

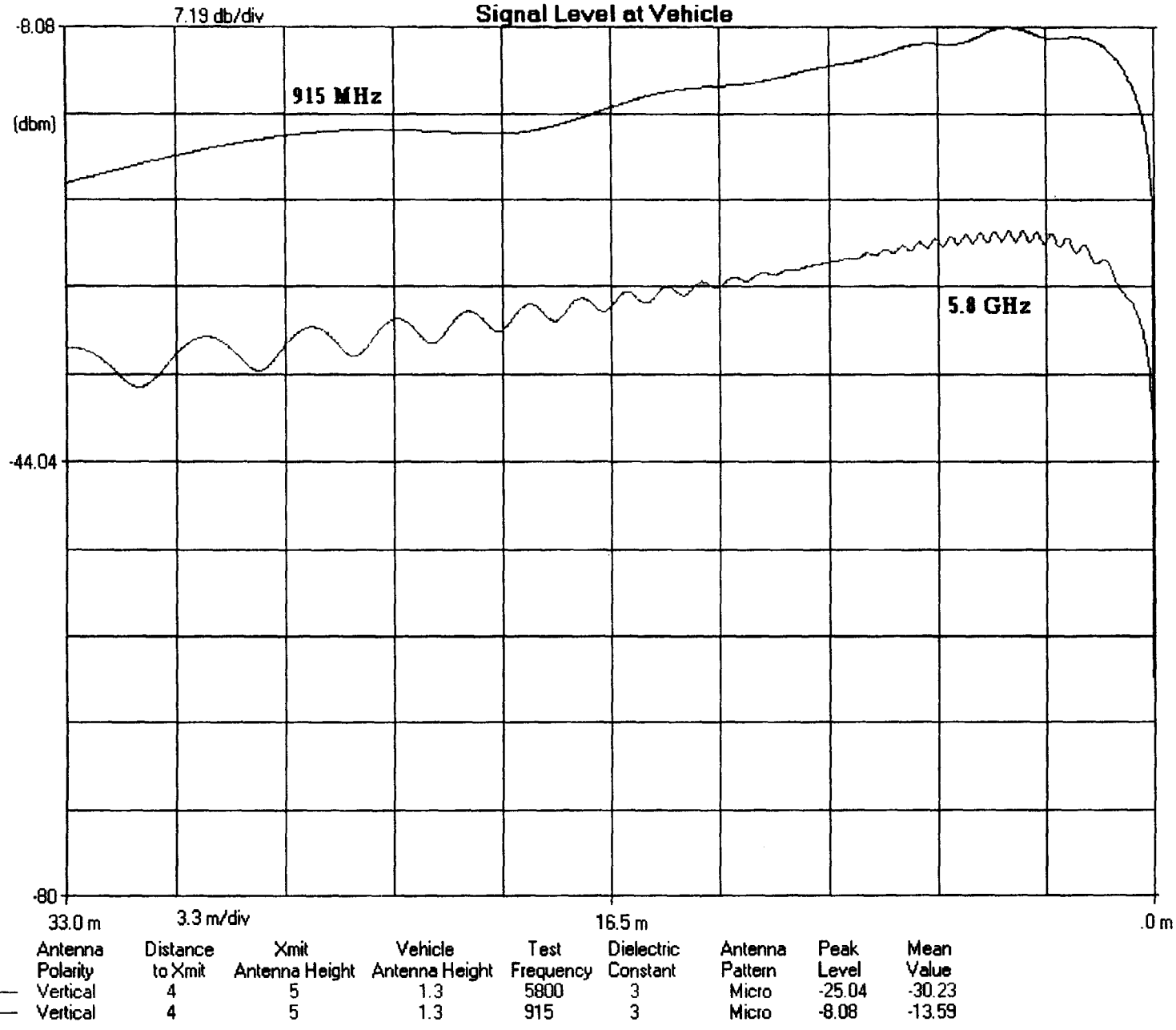
Antenna Height Vehicle
1.3 m

Frequency
915 MHz

Transmitter Power
1000 mW

Dielectric Constant
3

Figure 1 Horizontal Polarity



Antenna Polarity	Distance to Xmit	Xmit Antenna Height	Vehicle Antenna Height	Test Frequency	Dielectric Constant	Antenna Pattern	Peak Level	Mean Value
Vertical	4	5	1.3	5800	3	Micro	-25.04	-30.23
Vertical	4	5	1.3	915	3	Micro	-8.08	-13.59

Vertical Polarity
Microstrip
Multiple Plot
dbm Scale

Start Distance
33 m

End Distance
0 m

Steps
1000

Y Distance
4 m

Antenna Height Roadside
5 m

Antenna Height Vehicle
1.3 m

Frequency
915 MHz

Transmitter Power
1000 mW

Dielectric Constant
3

Figure 2 Vertical Polarity

CERTIFICATE OF SERVICE

I, Mary Lee Broyles, an employee of the law firm of Blooston, Mordkofsky, Jackson & Dickens hereby certify that on the 17th day of September, 1997, copies of the foregoing "Reply Comments" were deposited in the U.S. mail, postage prepaid, addressed to:

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